Interventional Radiology in Peripheral Vascular Disease: How Far Can We Go?

Dr. L. F. CHENG
Department of Radiology
Princess Margaret Hospital
The era of innovation in image-guided intervention was initiated on 16th Jan 1964, when....
Prof. Charles Dotter

• On 16\textsuperscript{th} January 1964, Prof. Charles Dotter, an interventional radiologist, performed the 1\textsuperscript{st} recorded angioplasty in the world

• He used progressively larger catheters to dilate a superficial femoral artery (SFA) stenosis
Prof. Charles Dotter

• On 16\textsuperscript{th} January 1964, Prof. Charles Dotter, an interventional radiologist, performed the 1\textsuperscript{st} recorded angioplasty in the world

• He used progressively larger catheters to dilate a superficial femoral artery (SFA) stenosis
Suboptimal outcome of balloon angioplasty:

- Elastic recoil
- High re-stenosis rate, especially in long stenosis and occlusion
- Flow limiting dissection
Suboptimal outcome of balloon angioplasty:

- Elastic recoil
- High re-stenosis rate, especially in long stenosis and occlusion
- Flow limiting dissection
Suboptimal outcome of balloon angioplasty:

- Elastic recoil
- High re-stenosis rate, especially in long stenosis and occlusion
- Flow limiting dissection
Suboptimal outcome of balloon angioplasty:

- Elastic recoil
- High re-stenosis rate, especially in long stenosis and occlusion
- Flow limiting dissection
Suboptimal outcome of balloon angioplasty:

- Elastic recoil
- High re-stenosis rate, especially in long stenosis and occlusion
- Flow limiting dissection
Can vascular stent improve the outcome? YES!!
Balloon Angioplasty versus Implantation of Nitinol Stents in the Superficial Femoral Artery

Martin Schillinger, M.D., Schila Sabeti, M.D., Christian Loewe, M.D., Petra Dick, M.D., Jasmin Amighi, M.D., Wolfgang Mlekusch, M.D., Oliver Schlager, M.D., Manfred Cejna, M.D., Johannes Lammer, M.D., and Erich Minar, M.D.
RESULTS

The mean (±SD) length of the treated segment was 132±71 mm in the stent group and 127±55 mm in the angioplasty group. Secondary stenting was performed in 17 of 53 patients (32 percent) in the angioplasty group, in most cases because of a sub-optimal result after angioplasty. At 6 months, the rate of restenosis on angiography was 24 percent in the stent group and 43 percent in the angioplasty group (P=0.05); at 12 months the rates on duplex ultrasonography were 37 percent and 63 percent, respectively (P=0.01). Patients in the stent group were able to walk significantly farther on a treadmill at 6 and 12 months than those in the angioplasty group.
RESULTS

The mean (±SD) length of the treated segment was 132±71 mm in the stent group and 127±55 mm in the angioplasty group. Secondary stenting was performed in 17 of 53 patients (32 percent) in the angioplasty group, in most cases because of a suboptimal result after angioplasty. At 6 months, the rate of restenosis on angiography was 24 percent in the stent group and 43 percent in the angioplasty group (P=0.05). At 12 months the rates on duplex ultrasonography were 37 percent and 63 percent, respectively (P=0.01). Patients in the stent group were able to walk significantly farther on a treadmill at 6 and 12 months than those in the angioplasty group.
New generation nitinol vascular stents are ...

• More flexible, high scaffolding potential
• More durable, much less fracture rate
• High crush resistance
• Longer length available

Nitinol: metal alloy of nickel and titanium

Better primary patency rate
Nitinol Bare Metal Stent

- Unique design
- Woven by 6 pieces of nitinol wires
- High radial strength
- Highly flexible
- Low fracture rate
- FDA approves to deploy the stent in proximal popliteal artery
Treatment of complex atherosclerotic femoropopliteal artery disease with a self-expanding interwoven nitinol stent: midterm results from the Leipzig SUPERA 500 registry.

Werner M et al EuroIntervention 2014, 10(7):861-868

• Single centre registry
• 527 limbs in 470 patients
• Mean lesion length was 126.4mm

• **Primary patency** was **83.3% in 1 yr, 72.8% in 2 yrs**
• No fracture in 229 patients with Xray taken at a mean of 16.6 months
ePTFE Covered Nitinol stent

- Covered stent

- Endoprosthesis of ePTFE with PROPATEN Bioactive Surface (heparin bonded)

- To prevent the ingrowth of neointimal tissue and thrombosis

- Outer nitinol metallic skeleton

Viabahn
Sustained Benefit at 2 Years for Covered Stents Versus Bare-Metal Stents in Long SFA Lesions: The VIASTAR Trial
J. Lammer et al CVIR (2015) 38:25-32

• Prospective, randomized, single-blind, multicenter study
• 141 patients were enrolled
• Mean lesion length is 19cm
• **Primary patency rate of 63.1% in 2 years**
Drug eluting stent

- Nitinol stent coated with **Paclitaxel (3ug/mm²)**

- **Paclitaxel** is a chemotherapeutic drug to inhibit the vessel wall smooth muscle hyperplasia
Paclitaxel

- **Paclitaxel** is the a chemotherapeutic drug that is proven to be effective in inhibiting the vessel wall smooth muscle hyperplasia.

- It **blocks cells in G2/Mitotic phase** of cell cycle (unable to form a normal mitotic apparatus.)
Sustained Safety and Effectiveness of Paclitaxel-Eluting Stents for Femoropopliteal Lesions 2-Year Follow-Up From the Zilver PTX Randomized and Single-Arm Clinical Studies
Michael D. Dake et al JACC 2013 61(24):2417-27

• In the multi-centers, randomized control trial, 236 patients enrolled.

• Primary patency of **84.4% in 1 year** and **75% in 4 years**

• Stent fracture rate was 0.9% in 1 yr and 1.9% in 4 yr
Drug (Paclitaxel) coating technology is also applied to angioplasty balloon...

**Drug eluting balloon:**

- Fast deliver of drug with optimal dose to vessel wall
- Rather uniform drug distribution on the vessel wall surface
- Minimal vessel wall inflammation
- No significant systemic/toxic effect
## Results in major SFA stent trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Stent</th>
<th>No. of Patients</th>
<th>Mean Lesion Length (cm)</th>
<th>12 Months Primary Patency</th>
<th>Fracture Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIROCCO</td>
<td>2006</td>
<td>SMART</td>
<td>46</td>
<td>8.1</td>
<td>68.1 (2 yrs)</td>
<td>20</td>
</tr>
<tr>
<td>FAST</td>
<td>2007</td>
<td>Luminexx 3</td>
<td>101</td>
<td>4.5</td>
<td>68.3</td>
<td>12</td>
</tr>
<tr>
<td>Durability</td>
<td>2009</td>
<td>Everflex</td>
<td>151</td>
<td>9.6</td>
<td>72.2</td>
<td>8.1</td>
</tr>
<tr>
<td>Resilient</td>
<td>2010</td>
<td>Life Stent</td>
<td>134</td>
<td>7.1</td>
<td>81.3</td>
<td>3.1</td>
</tr>
<tr>
<td>DURABILITY 200</td>
<td>2011</td>
<td>Everflex</td>
<td>100</td>
<td>24.2</td>
<td>64.8</td>
<td>6</td>
</tr>
<tr>
<td>Zilver-PTX</td>
<td>2011</td>
<td>Zilver PTX</td>
<td>241</td>
<td>6.6</td>
<td>83.1</td>
<td>0.9</td>
</tr>
<tr>
<td>MISAGO 2</td>
<td>2012</td>
<td>Misago</td>
<td>744</td>
<td>6.4</td>
<td>87.6</td>
<td>3.1</td>
</tr>
<tr>
<td>SUPERA 500</td>
<td>2013</td>
<td>Supera</td>
<td>490</td>
<td>12.6</td>
<td>83.3</td>
<td>0</td>
</tr>
<tr>
<td>SUMMIT</td>
<td>2013</td>
<td>Epic</td>
<td>100</td>
<td>7</td>
<td>85.1</td>
<td>0</td>
</tr>
<tr>
<td>VIASTAR</td>
<td>2015</td>
<td>Viabahn</td>
<td>72</td>
<td>19</td>
<td>63.1 (2 yrs)</td>
<td>n.a.</td>
</tr>
</tbody>
</table>
## Results of Drug Coated Balloon in Fem-pop Lesions

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Mean Lesion Length (cm)</th>
<th>Primary Patency (12 mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>THUNDER</td>
<td>2008</td>
<td>7.4</td>
<td>79%</td>
</tr>
<tr>
<td>FemPac</td>
<td>2008</td>
<td>5.7</td>
<td>91% (6 mo)</td>
</tr>
<tr>
<td>PACIFIER</td>
<td>2012</td>
<td>7.0</td>
<td>91.4% (6 mo)</td>
</tr>
<tr>
<td>SFA Italian Registry</td>
<td>2012</td>
<td>7.6</td>
<td>83.7%</td>
</tr>
<tr>
<td>T. Zeller et al</td>
<td>2014</td>
<td>19</td>
<td>76.1 %</td>
</tr>
<tr>
<td>LEVANT 2 Trial</td>
<td>2014</td>
<td>19</td>
<td>73.5 %</td>
</tr>
<tr>
<td>Trial Name</td>
<td>Y-axis Value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIROCCO (SMART)</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAST (Luminex 3)</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DURABILITY (Everflex)</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZILVER-PTX (Zilver PTX)</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MISAGO 2 (Misago)</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUPERA 500 (Supera)</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUMMIT (Epic)</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIASTAR (Viabhn)</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THUNDER</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEMPAC</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PACIFIER</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFA Italian Registry</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zeller et al</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEVANT 2 Trial</td>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results in SFA Stenting Trials

<table>
<thead>
<tr>
<th>Fem-pop graft</th>
<th>12 months Primary Patency Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIROCCO (SMART)</td>
<td>FAST (Luminexx 3)</td>
</tr>
<tr>
<td>DURABILITY (Everflex)</td>
<td>DURABILITY 200 (Everflex)</td>
</tr>
<tr>
<td>RESILIENT (Life Stent)</td>
<td>ZILVER-PTX (Zilver PTX)</td>
</tr>
<tr>
<td>DURABILITY 200 (Everflex)</td>
<td>MISAGO 2 (Misago)</td>
</tr>
<tr>
<td>SUPERA 500 (Supera)</td>
<td>THUNDER</td>
</tr>
<tr>
<td>SUMMIT (Epic)</td>
<td>THUNDER</td>
</tr>
<tr>
<td>VIASTAR (Viabhn)</td>
<td>THUNDER</td>
</tr>
<tr>
<td>PACIFIER</td>
<td>FEMPAC</td>
</tr>
<tr>
<td>SFA Italian Registry</td>
<td>Zeller et al</td>
</tr>
<tr>
<td>LEVANT 2 Trial</td>
<td>LEVANT 2 Trial</td>
</tr>
</tbody>
</table>

The short and mid term primary patency of SFA stents and drug coated balloon angioplasty is comparable to surgical by-pass.
Peripheral vascular diseases may also cause toes gangrene and non-healing ulcers

...if crural or plantar arteries are affected !
Angiosomes of the Foot and Ankle and Clinical Implications for Limb Salvage: Reconstruction, Incisions, and Revascularization

Christopher E. Attinger, M.D.
Karen Kim Evans, M.D.
Erstein Balian, M.D.
Peter Blume, D.P.M.
Paul Cooper, M.D.
Washington, D.C.; New Haven, Conn.; and Millburn, N.J.

Background: Ian Taylor introduced the angiosome concept, separating the body into distinct three-dimensional blocks of tissue fed by source arteries. Understanding the angiosomes of the foot and ankle and their interaction among their source arteries is clinically useful in surgery of the foot and ankle, especially in the presence of peripheral vascular disease.

Methods: In 50 cadaver dissections of the lower extremity, arteries were injected with methyl methacrylate in different colors and dissected. Preoperatively, each reconstructive patient’s vascular anatomy was routinely analyzed using a Doppler instrument, and the results were evaluated.

Results: There are six angiosomes of the foot and ankle originating from the three main arteries and their branches to the foot and ankle. The three branches of the posterior tibial artery each supply distinct portions of the plantar foot. The two branches of the peroneal artery supply the anterolateral portion of the ankle and rear foot. The anterior tibial artery supplies the anterior ankle, and its continuation, the dorsalis pedis artery, supplies the dorsum of the foot. Blood flow to the foot and ankle is redundant, because the three major arteries feeding the foot have multiple arterial-arterial connections. By selectively performing a Doppler examination of these connections, it is possible to quickly map the existing vascular tree and the direction of flow.

Conclusions: Detailed knowledge of the vascular anatomy of the foot and ankle allows the plastic surgeon to plan vascularity sound reconstructions, the foot and ankle surgeon to design safe exposures of the underlying skeleton, and the vascular surgeon to choose the most effective revascularization for a given wound. (Plast Reconstr Surg. 117 (Suppl.): 261S, 2006.)
6 Angiosomes of foot and ankle

Posterior tibial artery:

- Calcaneal branch - > heel
- Medial plantar artery - > instep
- Lateral plantar artery - > lateral midfoot and forefoot

6 Angiosomes of foot and ankle

Peroneal artery:

- Anterior perforating branch - > lateral anterior upper ankle
- Lateral calcaneal branch - > Plantar and lateral heel

6 Angiosomes of foot and ankle

Anterior tibial artery:

- Anterior ankle
- *Dorsalis pedis artery* - > **Dorsum** of foot

By using the very low profile (0.014” and 0.018”) guidewires, supporting catheters and angioplasty balloon catheters (plain or drug coated) ...
We are now able to tackle the lesions in crural and plantar arteries
Big challenges in endovascular vascular treatment of PVD...

• Long chronic total occlusion (CTO)

• Heavily calcified plaque or vessel wall
For long chronic total occlusion (CTO) ...
Recanalisation of femoro-popliteal occlusions: improving success rate by subintimal recanalisation


Subintimal angioplasty to tackle CTO
Subintimal angioplasty

The **successful rate** is about **80-85%**...

**Unable to re-enter the true lumen** is most common reason of technical failure.
Subintimal angioplasty

The **successful rate** is about 80-85%...

**Unable to re-enter the true lumen** is most common reason of technical failure.
Subintimal angioplasty

The **successful rate** is about **80-85%**...

Unable to re-enter the true lumen is most common reason of technical failure.
Subintimal arterial flossing with antegrade-retrograde intervention (SAFARI) or bi-directional technique for subintimal recanalization
If all the methods fail to recanalize the CTO, we can use re-entry catheters...
Many devices designed to cross long CTO...
To tackle *calcified vessels and plaque*...
Scoring or cutting balloon

- Semicompliant angioplasty balloon encircled by 3-4 struts or micro blades

- Higher pressure on the struts or micro blades
Atherectomy Devices

- **Jetstream** from Boston Scientific

- **TurboHawk** Plaque Excision system from Covidien

- **Turbo-Elite Laser Atherectomy Catheter** from Spectranectics
Atherectomy Devices

- NOT recommended as a stand-alone therapy for PVD due to high re-stenosis rate

- However, if used with other devices (e.g. stent and angioplasty balloon), it may further improve the outcome
Commonly strategies of endovascular treatment of PVD in daily practice...
Aorto-iliac diseases...

- **Plain balloon angioplasty**
- Unless the lesion is very short, it is usually followed by **bare metal stenting**, which usually gives very good long term patency
- Need to have **good outflow** (i.e. femoropopliteal and calf vessels) to achieve good long term outcome
436 patients
486 lesions
Mean lesion length 3.4+-3.3cm
CTO 22.4%
Bare metal iliac stenting gives excellent long term patency rate!!
Femoropopliteal diseases...

- **Plain balloon angioplasty**

- Unless the lesion is very short, it is usually followed by *stenting* or *drug-coated balloon angioplasty* to improve long term patency

- **Drug-coated balloon** if the lesion is *across a joint* (hip or knee) or relatively *short*

- **Metal stent** if there is a *long lesion, elastic recoil* or flow limiting *dissection*

- **Good in-flow** (i.e. iliac vessels) and **good out-flow** (i.e. calf vessels) is crucial to achieve good long term outcome
Below the knee diseases...

- Low profile (0.014” or 0.018”) microguidewire and angioplasty balloon catheter

- Plain balloon angioplasty

- Try to open up as many calf vessels as possible to improve collateral flow

- Drug-coated balloon (e.g. in angiosome target artery) to improvement long term patency

- Tend not to put stent in crural vessels. Short metallic stent if significant residual stenosis

- Good in-flow (i.e. iliac and femoropopliteal vessels) is crucial to achieve good long term outcome
Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II)
Developed in collaboration with the TASC II Working Group

These societies have endorsed the guidelines

Mark A Creager representing the American College of Cardiology

Peter Sheehan representing the American Diabetes Association

Joseph M Caporusso representing the American Podiatric Medical Association

Kenneth A Harris representing the Canadian Society for Vascular Surgery

Johannes Lammer/Marc Sapoval representing the Cardiovascular and Interventional Radiology Society of Europe

Denis Clement representing the CoCaLiS collaboration

Henrik Sllsen/Christos Lapis representing the European Society for Vascular Surgery

Nicholaas C Schaper representing the International Diabetes Federation

Salvatore Nova representing the International Union of Angiology

Kevin Bell representing the Interventional Radiology Society of Australasia

Hiroshi Shigematsu/Kimihito Komori representing the Japanese College of Angiology

Christopher White/Kenneth Rosenfield representing the Society for Cardiovascular Angiography and Intervention

John White representing the Society for Vascular Surgery

Mahmood Razavi representing the Society of Interventional Radiology

Michael R Jaff representing the Society for Vascular Medicine and Biology

John V Robbs representing the Vascular Society of Southern Africa
Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II)

Type A lesions:
- Unilateral or bilateral occlusions of CFA
- Unilateral or bilateral single short (2-4 cm) occlusions of CIA

Type B lesions:
- Great saphenous vein or superficial femoral artery involvement
- Bilateral CFA occlusion
- Single or multiple lesions involving 3-5 cm of the EIA not extending into the CFA
- Unilateral EIA occlusion not involving the aneurysm of the infrainguinal arteries

Type C lesions:
- Bilateral CIA occlusions
- Bilateral EIA occlusions 3-10 cm long not extending into the CFA
- Unilateral EIA lesions extending into the CFA
- Unilateral EIA occlusions that involve the aneurysm of the infrainguinal arteries
- Nearly complete unilateral EIA occlusion with or without involvement of origins of internal iliac and/or CFA

Type D lesions:
- Infrarenal aortic occlusion
- Diffuse disease involving the aorta and both iliac arteries requiring treatment
- Diffuse disease involving the unilateral CIA, EIA, and CFA
- Unilateral occlusions of both CIA and EIA
- Bilateral occlusions of CIA
- Ruptured aneurysm with AAA requiring treatment and not amenable to endograft placement or other lesions requiring open repair or femoral surgery

Type D lesions:
- Chronic total occlusion of CFA or SFA >30 cm
- Distal (posterior tibial artery)
- Chronic total occlusion of popliteal artery and proximal infrapopliteal vessels

Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II)

- TASC A lesions: Endovascular therapy is the treatment of choice
- TASC B lesions: Endovascular treatment is preferred
- TASC C lesions: Surgery is preferred treatment for good-risk patients
- TASC D lesions: Surgery is the treatment of choice

Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II)

• TASC A lesions: Endovascular therapy is the treatment of choice

• TASC B lesions: Endovascular treatment is preferred

• TASC C lesions: Surgery is preferred treatment for good-risk patients

• TASC D lesions: Surgery is the treatment of choice

Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II)

• TASC A lesions: Endovascular therapy is the treatment of choice

• TASC B lesions: Endovascular treatment is preferred

• TASC C lesions: Surgery is preferred treatment for good-risk patients

• TASC D lesions: Surgery is the treatment of choice

- CTO of Lt SFA > 20cm
- TASC C lesion
- Successfully managed by angioplasty and stenting
- CTO of CIA, EIA and CFA
- TASC D lesion
- Successfully managed by angioplasty and stenting
Outcome of endovascular treatment in femoropopliteal TASC C and D lesions

<table>
<thead>
<tr>
<th>Studies</th>
<th>Devices used</th>
<th>Primary Patency at 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIASTAR</td>
<td>Viabahn (Covered stent)</td>
<td>78%</td>
</tr>
<tr>
<td>SUPERB</td>
<td>Supera (Bare metal stent)</td>
<td>86%</td>
</tr>
<tr>
<td>ZILVER PTX</td>
<td>Zilver PTX (Drug eluting stent)</td>
<td>80%</td>
</tr>
<tr>
<td>Zellar Registry</td>
<td>Drug coated balloon</td>
<td>73%</td>
</tr>
</tbody>
</table>

The result is comparable to surgical by-pass!
Inter-Society Consensus for the Management of Peripheral Arterial Disease (TASC II)

• TASC A lesions: Endovascular therapy is the treatment of choice

• TASC B lesions: Endovascular treatment is preferred

May not be valid now

• TASC C lesions: Surgery is preferred treatment for good-risk patients

• TASC D lesions: Surgery is the treatment of choice

So...how far can we go?
Summary:

- There has been great advancement with technology and skills in the endovascular treatment of PVD...
To overcome the long chronic total occlusion, we have...

- Subintimal angioplasty technique
- SAFARI technique or bi-directional approach
- Re-entry devices
- Other CTO devices and guidewires
- Percutaneous atherectomy devices (to remove the plaque)
To improve the patency of a lesion, we have...

• Long nitinol vascular stents (bare or covered)

• Drug coated balloons and drug eluting stents
Drug coated balloons and drug eluting stents

• Drug coated balloons will be more and more preferable \( (leaving \textit{no metallic foreign body behind}) \)
New generation of vascular stents

• We still need well designed metallic stents if ...

  - very long lesions
  - dissection
  - residual stenosis
Concerning lesions in below-the-knee arteries and tarsal arteries,

• Better understanding of the arterial supply of foot and ankle by angiosome concept (which artery should be targeted to treat)

• Low profile 0.014” and 0.018” microguidewire and long angioplasty balloon

• Low profile drug coated angioplasty balloon
In PVD, **endovascular approach** should always be considered 1\textsuperscript{st}...

- Less invasive as comparing with bypass surgery...
In PVD, *endovascular approach* should always be considered 1\textsuperscript{st}...

- The short and mid term outcome of endovascular treatment of PVD is comparable to surgical bypass, even in complicated TASC C and D PVD lesions.

- PVD involving crural and tarsal arteries can now be tackled by endovascular approach, where surgical bypass may be very challenging.

- Endovascular procedure can be repeated in case of restenosis and usually will not preclude the surgical bypass in future.
Peripheral vascular disease

- Drug coated balloon
- Plain balloon angioplasty
- Scoring/cutting balloon angioplasty
- Artherectomy
- Bare metal stent
- Covered stent
- Drug eluting stent
- Bioabsorbable stent
Peripheral vascular disease

- Many options and tools
  - Drug coated balloon
  - Scoring/cutting balloon angioplasty
  - Bare metal stent
  - Covered stent
  - Drug eluting stent
  - Bioabsorbable stent
  - Artherectomy

- Best clinical outcome?
- Most cost effective?
- Need more prospective studies
We should not forget other treatment modalities, such as...
Management of PVD needs multidisciplinary approach...

- Family physicians
- Vascular surgeons
- Orthopedic surgeons
- Physicians
- Radiologists
- Nurses
- Podiatrist
- Physiotherapists
- Occupational therapists
- ...

TEAM WORK!
- Useful information about various interventional radiology procedures
- Patient information leaflets of different IR procedures